IV. Kits

Also described herein are kits comprising one or more of the methods, systems and/or compositions described herein. In particular, a kit can include one or more of the following: instructions (methods) of obtaining electronic images; systems or instructions for evaluating electronic images; one or more computer means capable of analyzing or processing the electronic images; and/or one or more surgical tools for implanting an articular repair system. The kits can include other materials, for example, instructions, reagents, containers and/or imaging aids (e.g., films, holders, digitizers, etc.).

The following examples are included to more fully illustrate the present invention. Additionally, these examples provide preferred embodiments of the invention and are not meant to limit the scope thereof.

Example 1

Design and Construction of a Three-Dimensional Articular Repair System

Areas of cartilage are imaged as described herein to detect areas of cartilage loss and/or diseased cartilage. The margins and shape of the cartilage and subchondral bone adjacent to the diseased areas are determined. The thickness of the cartilage is determined. The size of the articular repair system is determined based on the above measurements. (FIGS. **12-14**). In particular, the repair system is either selected (based on best fit) from a catalogue of existing, pre-made implants with a range of different sizes and curvatures or custom-designed using CAD/CAM technology. The library of existing shapes is typically on the order of about 30 sizes.

The implant is a chromium cobalt implant (see also FIGS. **12-14** and **17-19**). The articular surface is polished and the external dimensions slightly greater than the area of diseased cartilage. The shape is adapted to achieve perfect or near perfect joint congruity utilizing shape information of surrounding cartilage and underlying subchondral bone. Other design features of the implant can include: a slanted (60- to 70-degree angle) interface to adjacent cartilage; a broad-based base component for depth control; a press fit design of base component; a porous coating of base component for ingrowth of bone and rigid stabilization; a dual peg design for large defects implant stabilization, also porous coated (FIG. **12**A); a single stabilizer strut with tapered, four fin and step design for small, focal defects, also porous coated (FIG. **12**B); and a design applicable to femoral resurfacing (convex external surface) and tibial resurfacing (concave external surface).

Example 2

Minimally Invasive, Arthroscopically Assisted Surgical Technique

The articular repair systems are inserted using arthroscopic assistance. The device does not require the 15 to 30 cm incision utilized in unicompartmental and total knee arthroplasties. The procedure is performed under regional anesthesia, typically epidural anesthesia. The surgeon can apply a tourniquet on the upper thigh of the patient to restrict the blood flow to the knee during the procedure. The leg is prepped and draped in sterile technique. A stylette is used to create two small 2 mm ports at the anteromedial and the anterolateral aspect of the joint using classical arthroscopic technique. The arthroscope is inserted via the lateral port. The arthroscopic instruments are inserted via the medial port. The cartilage defect is visualized using the arthroscope. A cartilage defect locator device is placed inside the diseased cartilage. The probe has a U-shape, with the first arm touching the center of the area of diseased cartilage inside the joint and the second arm of the U remaining outside the joint. The second arm of the U indicates the position of the cartilage relative to the skin. The surgeon marks the position of the cartilage defect on the skin. A 3 cm incision is created over the defect. Tissue retractors are inserted and the defect is visualized.

A translucent Lucite block matching the 3D shape of the adjacent cartilage and the cartilage defect is placed over the cartilage defect (FIG. **13**). For larger defects, the Lucite block includes a lateral slot for insertion of a saw. The saw is inserted and a straight cut is made across the articular surface, removing an area slightly larger than the diseased cartilage. The center of the Lucite block contains two drill holes with a 7.2 mm diameter. A 7.1 mm drill with drill guide controlling the depth of tissue penetration is inserted via the drill hole. Holes for the cylindrical pegs of the implant are created. The drill and the Lucite block are subsequently removed.

A plastic model/trial implant of the mini-repair system matching the outer dimensions of the implant is then inserted. The trial implant is utilized to confirm anatomic placement of the actual implant. If indicated, the surgeon can make smaller adjustments at this point to improve the match, e.g. slight expansion of the drill holes or adjustment of the cut plane.

The implant is then inserted with the pegs pointing into the drill holes. Anterior and posterior positions of the implant are color-coded; specifically the anterior peg is marked with a red color and a small letter "A", while the posterior peg has a green color and a small letter "P". Similarly, the medial aspect of the implant is color-coded yellow and marked with a small letter "M" and the lateral aspect of the implant is marked with a small letter "L". The Lucite block is then placed on the external surface of the implant and a plastic hammer is used to gently advance the pegs into the drill holes. The pegs are designed to achieve a press fit.

The same technique can be applied in the tibia. The implant has a concave articular surface matching the 3D shape of the tibial plateau. Immediate stabilization of the device can be achieved by combining it with bone cement if desired.

The foregoing description of embodiments of the present invention has been provided for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Many modifications and variations will be apparent to the practitioner skilled in the art. The embodiments were chosen and described in order to best explain the principles of the invention and its practical application, thereby enabling others skilled in the art to understand the invention and the various embodiments and with various modifications that are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the following claims equivalents thereof.

What is claimed is:

1. A system for use in surgically replacing or resurfacing at least a portion of a hip joint of a patient, comprising:

a surgical instrument that includes a body having a patient-specific surface and a guide to direct or accommodate a surgical tool;

wherein at least a portion of the patient-specific surface has a shape that substantially matches a shape of a corresponding surface of the hip joint, wherein the corresponding surface of the hip joint includes an acetabular surface portion selected from the group consisting of an acetabular fossa, an acetabular rim, an acetabular wall, and any combination thereof;